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**United States Patent** [19]**Hungerford et al.**[11] **Patent Number:** **5,299,141**[45] **Date of Patent:** \* **Mar. 29, 1994****[54] AUTOMATIC FLUID MONITORING AND SAMPLING APPARATUS AND METHOD****[75] Inventors:** **William G. Hungerford; William D. Dickinson**, both of Medina, N.Y.**[73] Assignee:** **American Sigma, Inc.**, Medina, N.Y.**[\*] Notice:** The portion of the term of this patent subsequent to Feb. 25, 2009 has been disclaimed.**[21] Appl. No.:** **954,288****[22] Filed:** **Sep. 30, 1992****Related U.S. Application Data****[63]** Continuation-in-part of Ser. No. 846,602, Mar. 5, 1992, and Ser. No. 612,832, Nov. 13, 1990, Pat. No. 5,172,332, which is a continuation-in-part of Ser. No. 455,981, Dec. 22, 1989, Pat. No. 5,091,863.**[51] Int. Cl.<sup>5</sup>** ..... **G01F 11/00****[52] U.S. Cl.** ..... **364/510; 73/863.01; 141/1; 422/82.11****[58] Field of Search** ..... **364/509, 510; 73/863.01, 863, 863.02, 863.03, 863.34; 141/1, 89, 91, 94, 130; 422/82.11, 98; 385/12****[56] References Cited****U.S. PATENT DOCUMENTS**

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A fluid sampling apparatus provided as a unitary structure which automatically collects fluid samples according to modes of operation selected by a user, while monitoring an analyte of interest on a real-time basis on the basis of signals from a fiber optic sensor, and collecting and storing sampling and analyte data for later retrieval. The user may select from various modes of operation, including sampling triggered by a predetermined value(s) of the analyte, flow proportional sampling, and/or sampling at predetermined time intervals. The apparatus includes a self-contained microprocessor, together with associated program and data memory, for automatically controlling sampling operations, calculating analyte values on the basis of signals from the fiber optic sensor, calculating flow rate on the basis of signals from a flow sensing arrangement, and storing data relating to sample collection, analyte levels, and flow rate. The apparatus is further adapted to measure and store the actual discharge volume of the analyte loaded into a receiving fluid body, with the program memory being programmed to calculate loading values on the basis of flow rate values and analyte values as detected from any type of sensor capable of in situ real-time analyte measurement. Stored data can be called up on a display of the apparatus, or transferred to an external output device via a modem and telecommunication network or a portable data transfer unit.

**31 Claims, 10 Drawing Sheets**